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GAS ABSTRACTS

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1. GAS INDUSTRY

Industry Review

Duff, D. M. UTILITY SALES OF NATURAL GAS RECORD GREATEST INCREASE. *Oil Gas J.* **49**, 213-214 (1951) *January* 25.

Utility sales of natural gas increased to a new high in 1950. Preliminary American Gas Association figures are 3,694 billion cubic feet. The number of natural gas customers rose to 14,266,000.

J. D. Parent

Hulcy, D. A. GAS INDUSTRY ESTABLISHES NEW RECORDS. *Petroleum Engr.* **23D**, 42 44 (1951) *February.*

Gains in sales and revenues by the gas industry and by the natural gas industry in particular are reviewed.

J. D. Parent

NATURAL GAS TO CONTINUE RECORD EXPANSION. *World Oil* **132**, 148-150, 152 (1951) *February* 15.

Production and reserves statistics are presented. The natural gas industry growth continues to be phenomenal.

J. D. Parent

Lease Form

Ball, M. W. LET'S IMPROVE AND SIMPLIFY OUR OIL AND GAS LEASE FORM. *Oil Gas J.* **49**, 114-115 (1951) *February* 15.

Max Ball has suggested a simpler oil and gas lease form in order to avoid confusion, contradiction and to permit the layman to understand the document.

J. D. Parent

Light Hydrocarbons

Casper, J. C. S E R I E S OF NEW HIGHS REACHED BY LIGHT-HYDROCARBONS INDUSTRY. *Oil Gas J.* **49**, 208-209 (1951) *January* 25.

Natural gasoline and cycling plants set a new daily average output record of 20,833,000 gallons during the past year. LPG production now exceeds gasoline production. Finished gasoline and naphtha averaged 2,150,000 gallons per day during 1950. Gasoline price was quite variable during 1950, group 3 postings for grade 26-70 started at about 5.9¢ per gallon, dropped to 4¢ and increased to 6.9¢ by the end of the year.

J. D. Parent

NATURAL GASOLINE INCREASE LARGEST ON RECORD. *World Oil* **132**, 154-155 (1951) *February* 15.

Production of natural gas liquids continues to grow. 180,922 thousand barrels of natural gas liquids were produced in 1950.

J. D. Parent

Natural Gas Act

Crosby, S. H. TWELVE YEARS UNDER THE NATURAL GAS ACT. *Public Utilities Fortnightly* **47**, 333-338 (1951) *March* 15.

This is the first of a set of articles on the Natural Gas Act and its administration by the FPC. It is essentially historical except for a section in which the author praises the Commission's prudent investment theory.

J. D. Parent

Reviewer's comments: This article offers praise of the Commission's imposition of the prudent investment basis of rate regulation, but no arguments to substantiate the stand taken are offered. This greatly weakens the manuscript, as the opportunity to offer scholarly arguments has been sacrificed to present what amounts only to private opinion.

Pipe Lines

Lillie, S. 17,000 MILES OF NEW U. S. PIPE LINES EXPECTED DURING 1951. *World Oil* **132**, 205, 206, 208 (1951) *February* 15.

10,854 miles of natural gas pipe line were added during 1950. Greatest increase was in the large sizes. Mileage statistics are presented statewise for gas and oil lines.

J. D. Parent

Prices and Rates

Farrar, L. D. ARE NATURAL GAS PRICES HEADING FOR NEW HEIGHTS? *Gas* 27, 47-49 (1951) *March.*

Now that Oklahoma has been backed by the Supreme Court in its well head minimum price fixing it is strange to note that few other states seem interested in passing similar legislation. The effect of such legislation and the attitude of the FPC are discussed in a very general manner. It is suggested that price increases to the ultimate consumer are inevitable, although in some areas other factors such as pipe line investment and operating costs will be dominant.

J. D. Parent

Parker, L. T. COURTS DECIDE RIGHTS AND WRONGS OF RATE REGULATION. *Am. Gas J.* 174, 31, 32, 41 (1951) *January.*

Modern courts hold that a fair return should be realized on the reasonable value of the property used or invested for doing business after payment of costs and carrying charges. Some recent decisions as to fair return are reviewed.

J. D. Parent

Processing Plants

Tuttle, R. B. NEW FIELD PROCESSING PLANTS EXCEED BILLION-FOOT DAILY CAPACITY. *Oil Gas J.* 49, 251, 253 (1951) *January* 25.

Natural gas processing plants planned and those just built are listed. Total capacity will amount to 975 MMcf per day.

J. D. Parent

Reserves

Ingalls, P. C. PROVEN RESERVES OF CRUDE AND OTHER LIQUIDS CONTINUE CLIMB. *Oil Gas J.* 49, 197-199 (1951) *January* 25.

Proven reserves of crude oil and natural gas liquids continue to increase. Despite near record withdrawals estimates jumped 1,366 million barrels during the past year to 29,952 million barrels. Reserves of natural gas are said to be nearly 185 trillion cubic feet. Natural gas liquids reserves are said to be 3,831,500 thousand barrels as of the first of this year.

J. D. Parent

2. APPLIANCES

Burners

Hall, W. D. SAFETY CONTROL SYSTEM FOR GASEOUS FUEL BURNERS. U. S. 2,542,666 (1951) February 20.

A device is described to provide for combustion of gas flowing to the burner during the time interval required to activate the safety control system. Primarily this device consists of one large port on the burner head. When the gas rate decreases, pressure drop caused by the smaller sized ports force the total flow through the single large port.

D. L. Nicol

Lamar, C. C. and Peterson, V. C. (assigned to Harper-Wyman Co.) GAS BURNER WITH SECONDARY AIR BAFFLE. U. S. 2,544,603 (1951) March 6.

A range top burner is described in which a secondary air baffle is contained as an integral part of the burner head. The purpose of this baffle is to control the velocity of secondary air to a series of center ports on the burner head. It is claimed that this control permits the use of wider spaced ports on the center ring of ports without blowoff and with a relative increase in favorable heat distribution.

D. L. Nicol

3. COMBUSTION AND INDUSTRIAL FURNACES

Coal Combustion

Arthur, J. R., Bangham, D. H. and Crone, H. G. TOPOCHEMISTRY OF FUEL BEDS. *Ind. Eng. Chem.* 43, 525-528 (1951) *February.*

Experiments with fuel beds showed that the gasification ratio was roughly independent of particle size, and that combustion was practically complete after a path length of a single diameter. In addition, little CO was found in the ordinary combustion gases in channels between carbon blacks and in carbon tubes, but inhibitors greatly increased the CO content. In the last stages of burning, the CO content became very high. Some evidence was found for the internal burning of solid fuel. The results were applied to the design of a down-jet furnace, in which no metal grates are used, and which produces very close to the theoretical yield of CO_2.

W. E. Ball

Arthur, J. R. and Bowring, J. R. PHYSICO-CHEMICAL ASPECTS OF THE COMBUSTION OF SOLID FUELS. *Ind. Eng. Chem.* 43, 528-533 (1951) *February.*

Volatile additives, mainly phosphorus halides, increased the CO/CO_2 ratio, when present in concentrations of less than 0.5%. Water vapor made the inhibitor ineffective. Measurements in CO flames showed that additives decreased the hydrogen pressure. Of the halides deposited on the fuel, cupric and zinc chloride inhibited the reaction of CO to form CO_2 at 850°C, but all inorganic additives catalyzed the solid-gas reaction at lower temperatures. It was concluded that in principle either CO or CO_2 could be produced by controlling the minute quantities of hydrogen-containing compounds which propagate the CO combustion.

W. E. Ball

Townend, D.T.A. TOWARDS THE BETTER USE OF COAL. National Smoke Abatement Society. Margate Conference Proceedings, September, 1950.

The author inaugurates the series of Des Voeux lectures, a memorial to a pioneer in the British Smoke Abatement movement. The position of coal among fuels and energy sources is discussed. Measures to reduce waste are discussed generally, including improvements in practice and technology, also organization and scientific research of the fuel industries. The study of coal by analytical, geological and physico-chemical methods is summarized. The mechanism of burning is discussed from the standpoint of oxidation of the solid, the combustion of carbon monoxide and the liberation of volatile matter. Scientific aspects of smoke and fog are summarized with relation to the nature of grit, fume and smoke. Effects of sulfur are reviewed. Industrial uses of coal in steam raising, furnaces, down-jet combustion and solid fuel firing of gas turbines are treated. Developments in domestic use of coals are briefly discussed.

O. P. Brysch

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Gaydon, A. G. FLAMES; THEIR STRUCTURE AND RADIATION. p. 64

Gerstein, M., Levene, O. and Wong, E. L. FLAME PROPAGATION. . . p. 64

Simon, D. M. FLAME PROPAGATION. . . p. 64

4. CARBONIZATION AND GASIFICATION

By-Product Coke Plant

Pogacar, C. F. and Tice, E. A. CORROSION PROBLEMS IN THE MODERN BY-PRODUCT COKE PLANT. *Corrosion* 7, 76-84 (1951) *March.*

This presentation covers aspects of corrosion in a modern by-product coke plant, cites results of corrosion tests in the various processing steps and describes uses of corrosion resistant alloys in some of the newer units. The corrosion data presented have been collected through the use of spool corrosion tests in plant equipment under conditions of normal plant operation. Coal-handling equipment and plant buildings suffer rather severe atmospheric corrosion. The advantages of low alloy steels for such applications, and the use of protective coatings derived from coal-tar products are mentioned. Most of the paper is devoted to a discussion of materials of construction for equipment, beginning with the evolution of the gas in the ovens and ending with its storage in gas holders. A great deal of steel and cast iron can fortunately be used for handling ammonia liquors and for gas treatment. In the ammonium sulfate "saturator" the use of both Monel and Type 316 stainless steel have shown advantages which should lead to their continued use. In the process of light-oil recovery and refining, sulfuric-acid washing and light-oil distillation offer possibilities for the use of alloy materials. Coke quenching cars require frequent maintenance and replacement. To date, economics have necessitated the use of ordinary steel for the car structure and abrasion-resisting steel for the sloping floor. Also discussed are the construction materials for primary coolers, gas exhauster, tar precipitators, ammonia stills, and dephenolizing towers.

Authors' abstract

Carbonization

Atkinson, R. K. CARBONIZATION PROBLEMS. *Gas J.* (*British*) **265**, 433, 434, 437, 438 (1951) *February* 14.

The author discusses problems in maintaining gas output in a large plant of horizontal and inclined coal gas retorts. Effects of high moisture content and highly swelling coals are mentioned. Maintenance of speedy discharging and charging time, attention of gas pressures in mains and mouthpieces, and careful scurfing are recommended.

O. P. Brysch

Coal Preparation

Crentz, W. L., Steele, F. and Bailey, A. L. PREPARATION CHARACTERISTICS OF COAL OCCURRING IN INDIANA COUNTY, PA. *U. S. Bureau of Mines Report of Investigations* 4763 (1951) February.

This is the second paper in the series appraising the nation's coking coal reserves by counties, and the preparation characteristics which determine the utilization of these reserves. Over 95% of the reserves discussed here are in the Upper Freeport, Lower Freeport and Lower Kittanning beds. In 1948, of 8,547,988 tons produced, 40% or 3,521,583 tons were treated in 5 plants using combinations of 5 types of cleaning equipment. Laboratory washability studies on samples from 10 mines indicate wide variations in ash and sulfur. Also large areas of coal will offer great technologic difficulties to upgrading. Detailed graphs and tables of data on crushing and washing tests are included.

O. P. Brysch

Coal Properties

Dryden, I. G. C. ACTION OF SOLVENTS ON COALS AT LOWER TEMPERATURES. I. A QUALITATIVE SURVEY OF THE EFFECTS OF LIQUIDS UPON BRIGHT COALS OF LOW RANK. *Fuel* (*British*) **30**, 39-44 (1951) *February.*

The properties and behavior at room temperature of 54 solvents were tabulated. These solvents were divided into 5 classes, according to solvent power. Correlation of the data showed that solvent ability bears little relation to internal pressure, surface tension, dielectric constant, dipole moment, or basic strength. The best solvents contained a nitrogen or oxygen atom with an unshared pair of electrons, although availability and accessibility of these electrons was influenced by other features of the liquid.

W. E. Ball

Kuhlwein, F. L. INFLUENCE OF VOLCANIC HEAT ON THE RANK OF BOHEMIAN BROWN COAL. *Fuel (British)* **30**, 25-30 (1951) *February.*

Natural upgrading of Bohemian lignites is much more intensive than in German deposits. This is due chiefly to decrease in moisture content. Two natural processes of upgrading by volcanic heat are suggested by the properties of the brown coals: (1) fusion of resins by steam at about 350°C, a natural Fleissner treatment which dehydrates the colloidal humic matter and impregnates it with mobile resins, (2) intensified heating which produces prism-fracture and resin migration, the latter draining to the middle and bottom beds while H_2O and CO_2 are lost. The details of the regional thermal metamorphism of the South Erzgebirge coals are compared with those of other areas.

O. P. Brysch

Sherlock, E. STUDIES ON SOME PROPERTIES OF ALBERTA COALS. II. REFLECTIVITY. *Fuel (British)* **30**, 31-39 (1951) *February.*

The author's work on 16 Alberta coals tends to confirm the observation of Seyler that the reflectivity of polished blocks of petrologically homogeneous coals *increases in a stepwise* manner with increasing carbon content. The technique using block and powdered samples is described in considerable detail. Representative character of block and powdered samples, and relationship of reflectivity to rank are discussed.

O. P. Brysch

Coal Structure Theory

THE STUDY OF COAL AS A COLLOID AND THE PRESENT PICTURE OF COAL STRUCTURE. *Brit. Coal Utilization Research Assoc. Quarterly Gazette* 1950, 5-7 (No. 11).

This section of the memorial issue to Dr. D. H. Bangham, Director of Research of the B.C.U.R.A. from 1938 to 1950, describes his work on coal and its extension to present theories of coal structure. Heat of wetting and internal surface area studies, which showed tenfold differences between the bright bituminous coking and the low rank coals, led to density and porosity studies. The resulting model of structure applicable over the range of 80-90% carbon content consists of a cluster of 13 spherical micelles. The differences in compaction of this cluster explain the variation in rank with heats of wetting, porosity, and pore accessibility, without change in size of the micelle or in its basic chemical structure. The individual spherical micelles may result from two methods of aggregation known to occur in many colloidal systems: (1) the long chain cellulose, lignin and protein macro-molecules may shorten and consolidate individually by folding up, and then regrouping irregularly, or (2) they may remain straight, but group in radial symmetry. These loose aggregates then stabilize during geologic metamorphism into the cross-linked, chemically condensed micelles, whose chemical structure is unknown, but is doubtless of polycyclic form because of the high C:H ratio. The smaller-scale atomic arrangement within the molecule revealed by X-ray technique requires further clarification.

O. P. Brysch

Coke Ovens

Powell, A. R. (assigned to Koppers Co., Inc.) COKE OVEN APPARATUS. U.S. 2,540,138 (1951) February 6.

The apparatus described is a two-part levelling bar for coke ovens. The upper part, composed of two spaced channel beams, is locked to the lower part, which is a wider channel with smooth solid upper surface, thereby forming a long narrow box. This box-like space is filled with *coke breeze* from a feed-hopper as it first moves into the oven during a normal levelling operation, the breeze preventing heaped coal from entering the box. After reciprocation of the locked bar is sufficient to level the charge of coal, the upper part, fully inserted in the oven, is held stationary, while the lower portion is unlocked and withdrawn permitting the breeze to fall upon the top of the coal charge and form a permeable layer thereon. Then the upper portion of the bar is withdrawn and the oven closed.

O. P. Brysch

Price, J. D. CONTROLLED COOLING OF A KOPPERS-BECKER BATTERY. *Blast Furnace & Steel Plant* **39**, 203-213 (1951) *February.*

The Colorado Fuel and Iron Corp. carefully cooled one of their batteries, with the objective of returning it to service at some later date. All steelwork and piping which could hinder free movement was loosened. Temperatures were lowered according to a reversed heating-up curve, with the buckstay springs kept under compression to take up contraction. Although the original expansion of the battery had been 8 in., contraction amounted to only 1.8 in. After cooling, the general condition of the brickwork was good, although some cracks as large as 1¼ in. appeared in the walls. It was felt that the cooling operation was successful, and that the battery could be re-operated after the necessary repairs have been made.

W. E. Ball

High Btu Oil Gas

Nissel, H. E. BUNKER C OIL CUTS OPERATING COSTS OF GAS UTILITY. *Gas Age* **107**, 17-21, 64, 66, 68 (1951) *February* 1.

It can be stated from the experience in Bangor during about 2500 operating hours on heavy oil, that the twin generator back blast oil gas process permits an inexpensive, space-saving conversion from water gas to high B.t.u. oil gas using high carbon oils; that such conversion nearly doubles the thermal capacity and reduces F.O.T.S. cost by up to 50%; that maintenance costs are reasonable and that the tar poses no exceptional problem. It has further been demonstrated that distribution of diluted oil gas in commercially feasible when distribution capacity is sufficient and the considerable cost of a changeover to high B.t.u. gas is to be avoided.

Author's abstract

H_2S Removal

Minchin, L. T. LIQUID PURIFICATION — SOME BRITISH AND CONTINENTAL DEVELOPMENTS. *Coke & Gas* (*British*) **13**, 27-29 (1951) *January.*

The subject of H_2S removal from coal gas by liquid processes is discussed in general terms. The reader's attention is drawn in particular to: (1) Dutch State-Mines-Otto process, which is based on the use of a potassium ferrous ferrocyanide scrubbing solution that is revivified by air blowing with recovery of sulfur in rather impure form; and (2) Heinrich Koppers Szombathy liquid catalyst process, which is based on the use of a sodium thiosulfate scrubbing solution containing an oxygen carrier catalyst that is revivified by air blowing with recovery of sulfur. Successful operation of a pilot plant purifying 300Mcf/day by the Szombathy process has led to plans for construction of a full scale plant to handle 7MMcf/day.

H. Hakewill

Methane Recovery from Mines

Minchin, L. T. FIRE DAMP — A NEW SOURCE OF FUEL. *Gas World* (*British*) **133**, 211-213 (1951) *February* 24.

The drainage of methane from coal strata by special piping to improve safety and working conditions began at the Mansfield Colliery in the Ruhr in 1943. Greatest progress in development of this source of methane has occurred at Frameries, near Mons, Belgium, since July, 1949. Here boreholes are made 200 ft into overhead strata as the working face is advanced in the coal seam; a drain pipe is sealed by cement into the loose strata and connected to a 6-in. collecting main through which the gas is drawn by pumps. Six holes have produced 770M/day of 90% methane (900 Btu). Two other nearby mines producing methane are connected to the same "grid" of the "Distrigaz" Company, with others to be added. At Ressaix, three mines produce methane (2000 Mcf/day) to be cracked to 450 Btu "grid" gas. At Charleroi, two mines are diluting with waste gas before adding it to the coke-oven gas grid network. Ultimately mines from Liege to Mons will be linked by "Distrigaz" to expand the present 3500M/day to an estimated 14,000 M/day.

O. P. Brysch

Natural Gas Reforming

Paquette, R. B. REFORMING NATURAL GAS IN WATER GAS SETS. *Gas Age* **107**, 14-16, 50, 51 (1951) *March* 1.

The experience of the Peoples Gas Light and Coke Company of Chicago in reforming natural gas in conventional water gas machines (9-foot grate) is described. A production rate of 389 Mcf per hour (6 Mcf/sq ft grate area-hour) is obtained in a 3-minute cycle which uses 519 cu ft of natural gas per Mcf of reformed gas. The lampblack problem is minimized by specifying coke of relatively low ash fusion temperature, around 2300°F, and by maintaining the fuel bed as deep as possible. A small amount (12 gallons per hour) of gas oil purges the piping and provides an oily film, protecting exposed steel work from acid corrosion. The pH of the drips and circulating water is low and requires a high replacement rate for control. The checker brick probably because of silica vaporization deteriorates and annual replacement appears advisable. A material balance for the reforming process is presented which indicates 23% cracking of the hydrocarbon content of the natural gas.

C. H. Riesz

Propane Reforming

Domisse, J. P. and Adam, A. REFORMING OF PROPANE IN WATER GAS SETS. *Gas World* (*British*) **133**, 152-157 (1951) *February* 10.

Previous developments in the reforming of natural gas, refinery oil gas and liquefied petroleum gases are reviewed. Since the heat stored in the generator is fixed by temperature limitations, consideration of the heat requirements of the blue gas and propane reforming reactions indicated that propane reforming would increase gas production about 30% over that possible in blue gas manufacture. Two such tests on a 5-foot Humphreys and Glasgow water gas set confirmed that a 30% increase in production was possible. The reformed gas was appreciably higher in heating value and lower in specific gravity than the blue gas. It is concluded that propane should have important application in the Dutch gas industry for thermal and catalytic cracking and for cold enrichment.

C. H. Riesz

Tar Emulsion Treatment

Pincus, I., Ockert, K. F. and Kinney, C. R. BREAKING WATER-TAR EMULSIONS WITH SURFACE-ACTIVE AGENTS. *Ind. Eng. Chem.* **43**, 521-524 (1951) *February*.

The use of surface-active agents in the breaking of water-tar emulsions formed in the production of enriched water gas is described. The effects on the emulsions of varying concentrations of the acetic acid salt of dimethylaminoethyl oleate, Amine 320, Sterox SE, Sterox SK and four modifications of Amine 220 were investigated. Additional effects produced by 0.5% sodium carbonate were also noted. In general it was found that the high water content emulsions were more easily broken than the low water content emulsions.

C. A. Berg

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Coffey, J. F. HYDROGEN MANUFACTURE. p. 67

Hoog, H. CATALYTIC HYDRO-DESULFURIZATION OF GAS OIL: ANALYSIS OF THE KINETICS OF REACTION. p. 65

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Acidizing

Clason, C. E. HYDRAFRAC AND ACIDIZING FOR PROCESSING LIMESTONES. *World Oil* **132**, 144 (1951) *March*.

Combination of the Hydrafrac and acidizing processes for limestone and calcareous formations is suggested. Hydrafrac gel is first pumped in and this is followed immediately by acid. The acid breaks down the gel and reacts with the formation. The acid is finally displaced with oil.

J. D. Parent

Simon, G. D. ACIDIZING PRACTICES IN CANYON REEF SECTION, SCURRY COUNTY. *World Oil* **132**, 100, 102 (1951) *March*.

A survey of past practices in Scurry County, Texas, leads to the conclusion that wells should be acidized here only when necessary to meet

the top allowable field requirements. The first stage should be a wash job primarily. Each well should then be treated as an individual problem.

J. D. Parent

Amine-Plant Corrosion

Riesenfeld, F. C. and Hughes, C. L. CORROSION IN AMINE GAS TREATING PLANTS. *Petroleum Refiner* **30**, 97-106 (1951) *February.*

The regenerative equipment—stills, reboilers and coolers—was found to be the most severely attacked by the amine solutions. The results of testing pilot-plant size heat-exchangers constructed of either aluminum 3S or 4-6 Cr-½ Mo steel are described. Additional data concerning commercial amine treating plants using aqueous and glycol-amine systems under differing conditions are discussed.

B. E. Hunt

Carbon Black Manufacture

Cabot, L. W., Edminster, J. W. and Stokes, C. A. THE MANUFACTURE OF FURNACE CARBON BLACK FROM LIQUID HYDROCARBONS AT ELLESMERE PORT. *J. Inst. Petroleum (British)* **36**, 707-726 (1950) *December.*

The manufacture of furnace type carbon black from liquid hydrocarbons at Ellesmere Port is reviewed. The raw material must, as yet, be imported from the U.S.

J. D. Parent

Condensate Removal

Simon, J. T. HYDROCARBON DEWPOINT CONTROL BY GAS REFRIGERATION. *World Oil* **132**, 175-177 (1951) *March.*

Where liquefiable hydrocarbons are not removed from natural gas prior to transmission, drips or scrubbers are used at strategic points. Due to variable flow conditions the location of points of liquid removal is a hit and miss process.

J. D. Parent

Dehydration

Ames, C. B. NATURAL GAS DEHYDRATION IS ROBOTIZED IN 15 SOLID DESICCANT TYPE PLANTS. *Am. Gas J.* **174**, 11-13 (1951) *February.*

A flow sheet is given for robotized dehydration of natural gas by florite. The instrumentation is indicated on the flow sheet and explained in considerable detail.

J. D. Parent

Laurence, L. L. and Reid, L. S. NEW ADSORPTION PROCESSES FOR GAS DEHYDRATION. *Petroleum Engr.* **23C**, 25, 26, 29, 30 (1951) *March.*

The Black, Sivalls & Bryson dehydration systems for small capacity requirements are explained. One type is for well head application and the other for transmission lines. Solid dessicant is employed. Automatic control is employed.

J. D. Parent

Records, L. R. and Seely, D. H., Jr. LOW TEMPERATURE DEHYDRATION OF NATURAL GAS. *J. Petroleum Technol.* (sec. 1) **3**, 61-66 (1951) *February.*

A process for low temperature dehydration of natural gas by means of self-cooling due to free expansion through an orifice is reported as effective. The process is limited by the available pressure drop.

J. D. Parent

Helium

Cattell, R. A. and Wheeler, H. P., Jr. GROWING DEMAND IS SEEN FOR HELIUM. *Petroleum Refiner* **30**, 91-94 (1951) *March.*

Helium can currently be bought for 1½¢ per cu ft. The properties of helium are summarized and a flow sheet for its production from natural gas is given and explained.

J. D. Parent

L P Gas Recovery

Kube, A. M. L. OBSERVATIONS AND PROBLEMS IN RECOVERY AND RETENTION OF LIGHT HYDROCARBONS. *Oil Gas J.* **49**, 98-100, 103, 104, 107, 108, 117 (1951) *February* **15.**

Some of the basic principles in the recovery of light hydrocarbons from natural gas are presented. One of the many topics discussed is the

utility of double fractionation. It is said that it may be more economical to use a low reflux ratio on the depropanizer, which leaves some propane in the bottoms product, and to then use a cleanup column on the debutanizer overhead product to recover the remaining propane.

J. D. Parent

Natural Gasoline

Willard, B. J. and McCaleb, T. L. WATER TREATMENT IN NATURAL-GASOLINE PLANTS. *Oil Gas J.* **49**, 78, 80, 82-84 (1951) *March* 8.

Water treatment is normally required to control corrosion and prevent deposition of mineral matter and organic slime on equipment. Better heat transfer rates and longer equipment life are prime benefits of proper water control. Common treatment processes are reviewed.

J. D. Parent

Nitrogen Removal

Born, P. L. and Meiller, D. V. LIQUEFYING AND REGASIFYING NATURAL GASES. U.S. 2,541,569 (1951) February 13.

Cascade refrigeration involving ammonia, ethylene and methane is used. Separation of higher molecular weight materials is achieved by partial liquefaction. The remainder, which is largely methane, ethane and nitrogen, is then largely condensed in such a way as to leave most of the nitrogen in the vapor state for venting. Flashing removes more nitrogen.

J. D. Parent

Pipe Lines

Parker, M. E. INSPECTION OF PIPE COATINGS. *World Oil* **132**, 178, 180, 182, 184, 186, 188 (1951) *March*.

A central figure in any pipeline installation is the coating inspector who must approve a coating before the pipe may be buried. All stages of handling, from the initial surface preparation to the final back filling of the ditch must be carefully watched to insure the most satisfactory coating. Check lists are provided which indicate the many important steps which must be watched in both yard-coated pipe procedures and in over-the-ditch coatings.

B. E. Hunt

Reed, P. TURBINES FOR GAS LINE. *Oil Gas J.* **49**, 169 (1951) *January* 25.

El Paso Natural Gas Co. is planning to install a number of centrifugal compressors powered by gas turbines. Provision is being made for remote control. Advantages claimed are (1) simplicity, (2) economy of space, (3) easy adaptation to remote control and (4) decreased cooling water requirements.

J. D. Parent

Production

Frost, E. M., Jr. HELIUM TRACER GAS STUDIES. *Petroleum Engr.* **23B**, 7-12, 14, 16, 18, 20 (1951) *March*.

A cooperative helium tracer gas project of the U.S. Bureau of Mines and Lion Oil Company in Arkansas is reported. This project permitted the observers to follow the flow of injected gas through the formation.

J. D. Parent

Frye, C. C. and Clement, F. M. CORROSION MITIGATION IN THE NORTH McCALLUM FIELD. PART 1. *World Oil* **132**, 138-140 (1951) *March*.

Background information is given concerning the corrosion encountered in this distillate field. Effluents from the wells consisted of approximately 93½% CO_2 by weight, the remainder being hydrocarbons with a small amount of water. No H_2S was present and the water was typical of true condensate waters in that a very low concentration of salts was present. Severe corrosion was encountered in both the tubing and casing of producing wells. Under shut-in conditions or when a well was not flowing there seemed to be no corrosion. The second part will discuss the inhibitor testing program.

B. E. Hunt

Ledford, R. C. TAPPING A SUBMARINE GAS FIELD. *Gas* **27**, 78, 80-82 (1951) *February*.

When gas condensate wells are completed off shore several factors must be considered: wind, wave and tide action, corrosion, shifting currents, marine organisms and marine traffic. Heavy walls for negative buoyancy, coating, cathodic protection and barnacle-repellant in the coating are some of the measures employed. A unique situation is the use of line markers.

J. D. Parent

METHODS OF DRILLING FOR GAS OR OIL. *Am. Gas J.* 174, 27-30 (1951) *March.*

This is a very simple presentation of the major aspects of drilling for natural gas.

J. D. Parent

Storage

DRILLING RIG: IMPORTANT TOOL OF THE GAS TRANSMISSION COMPANY. *Gas* 27, 77 (1951) *February.*

Some general information is presented concerning the joint storage project of New York State Natural Gas Corp. and Texas Eastern. Some $40,000,000 is to be spent in reconditioning the vast North Oakford pool near Jeanette, Pa.

J. D. Parent

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Claussen, W. F. SUGGESTED STRUCTURE OF WATER IN INERT GAS HYDRATES. p. 65

Domisse, J. P. and Adam, A. REFORMING OF PROPANE IN WATER GAS SETS. p. 55

Fulton, W. F. METHOD OF SEPARATING SELECTED CONSTITUENTS FROM GASES. p. 66

Hough, E. W., Rzasa, M. J. and Wood, B. B. INTERFACIAL TENSIONS AT RESERVOIR PRESSURES AND TEMPERATURES; APPARATUS AND THE WATER-METHANE SYSTEM. p. 65

Hutchinson, A. J. L. A SYSTEM OF PROCESS CALCULATIONS FOR LIGHT HYDROCARBONS. p. 66

Kellogg, L. A. A CORROSION CONTROL PROGRAM. p. 68

Paquette, R. B. REFORMING NATURAL GAS IN WATER GAS SETS. p. 55

CENTRIFUGAL COMPRESSORS IN PETROLEUM ENGINEERING. p. 60

CORROSION AND ITS CONTROL: ATTENUATION CURVES IN CATHODIC PROTECTION. p. 68

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Annual Report: Synthetic Liquid Fuels

SYNTHETIC LIQUID FUELS. ANNUAL REPORT OF THE SECRETARY OF THE INTERIOR FOR 1950. PART I. OIL FROM COAL. *U.S. Bureau of Mines Report of Investigations* 4770 (1951) February.

During 1950, one vapor-phase and four liquid-phase tests were completed in the high-pressure hydrogenation plant with a combined "on-stream" time of about 100 days. Tests of the Koppers coal-dust gasifier were discontinued in April, 1950; the 80% carbon gasification efficiency was lower than anticipated. A Kerpely gas producer using air, oxygen and air-oxygen mixtures was operated successfully on coke and Disco char in cooperative tests with the A.G.A. and the Koppers Company. At the Bruceton laboratories, a "moving-catalyst-bed" process has been studied for hydrocarbon synthesis. Nitrided iron catalysts were found to be durable and active. Gasification and purification investigations at Morgantown have been continued. Underground gasification at Gorgas, Alabama, was continued. Production of a combustible gas has been sporadic because of bypassing; use of the hot gases from the underground combustion to drive a small gas-turbine has been accomplished.

C. H. Riesz

SYNTHETIC LIQUID FUELS. ANNUAL REPORT OF THE SECRETARY OF THE INTERIOR FOR 1950. PART II. OIL FROM OIL SHALE. *U.S. Bureau of Mines Report of Investigations* 4771 (1951) February.

During 1950 estimates of potential oil shale reserves in Colorado were revised upward (500 billion barrels of shale oil in known formations). Improved drilling, blasting, and mining procedures were developed in experimental mines. At Rifle, Colorado, the gas-combustion retort process was found promising. The heat exchange between gas and oil takes place within the retort; no cooling water is required, a distinct advantage. The investment and processing costs appear lower than other methods.

At Laramie, Wyoming, tests showed formation of aromatic oils from retorting at 1500°F. Research on refining shale oil and its products were continued.

C. H. Riesz

SYNTHETIC LIQUID FUELS. ANNUAL REPORT OF THE SECRETARY OF THE INTERIOR FOR 1950. PART III. LIQUID FUELS FROM AGRICULTURAL RESIDUES. *U.S. Bureau of Mines Report of Investigations* 4772 (1951) February.

After two years of work as part of the Synthetic Liquid Fuels program, the program at the Northern Regional Laboratory of the U.S. Department of Agriculture at Peoria, Illinois, was discontinued on June 30, 1950. The hydrolyzation of corn cobs was studied in semi-works tests; difficulties in this scale of operations have been solved in laboratory tests.

C. H. Riesz

SYNTHETIC LIQUID FUELS. ANNUAL REPORT OF THE SECRETARY OF THE INTERIOR FOR 1950. PART IV. OIL FROM SECONDARY RECOVERY AND REFINING. *U.S. Bureau of Mines Report of Investigations* 4773 (1951) February.

Field studies have been conducted in various oil formations. Group analyses of the sulfur constituents of crude naphthas were reported. These activities, as part of the Synthetic Liquid Fuels Act, terminated June 30, 1950.

C. H. Riesz

Catalysts

Friedman, A. H. (assigned to Phillips Petroleum Co.) PROCESS FOR REACTIVATING CATALYSTS. U.S. 2,540,109 (1951) February 6.

Catalyst which has become deactivated for the synthesis of hydrocarbons from carbon monoxide and hydrogen is regenerated by contact with synthesis gas at low space velocities (e.g. 0 to 10 volumes of synthesis gas per volume catalyst-hour) for a period of time (e.g. 17 hours).

C. H. Riesz

Jones, W. H., Long, F. M. and Krebs, R. W. (assigned to Standard Oil Development Co.) METHOD OF REGENERATING HYDROCARBON SYNTHESIS CATALYST. U.S. 2,541,654 (1951) February 13.

Carbon contained in fluidized catalyst used for the synthesis of hydrocarbons from carbon monoxide and hydrogen is removed by heating the fouled catalyst in an atmosphere of nitrogen or inert gas. The oxide content of the catalyst reacts with the carbon and effects its removal.

C. H. Riesz

Pierce, J. A. and Richardson, R. W. (assigned to Standard Oil Development Co.) CATALYST FOR THE SYNTHESIS OF HYDROCARBONS. U.S. 2,541,663 (1951) February 13.

A fluidized catalyst suitable for the synthesis of hydrocarbons from carbon monoxide and hydrogen is prepared by reacting granular aluminum with an iron salt to form a bimetallic couple of aluminum and iron on the surface.

C. H. Riesz

Segura, M. A., McAdams, D. R. and Spicer, W. E. (assigned to Standard Oil Development Co.) PREPARATION OF A FLUID CATALYST FOR HYDROCARBON SYNTHESIS. U.S. 2,541,671 (1951) February 13.

An iron catalyst resistant to disintegration is prepared by subjecting reduced precipitated iron oxide to sintering in an oxidizing atmosphere at 1200 to 1600°F followed by reduction at 800 to 1500°F.

C. H. Riesz

Segura, M. A. (assigned to Standard Oil Development Co.) CATALYST FOR THE SYNTHESIS OF HYDROCARBONS. U.S. 2,540,599 (1951) February 6.

Iron catalysts resistant to disintegration for use in the synthesis of hydrocarbons from carbon monoxide and hydrogen are prepared by bonding the promoted iron powder with an organic thermosetting resin.

C. H. Riesz

Wilcox, M. J. (assigned to Sinclair Refining Co.) STRIPPING OF OIL FROM SPENT CRACKING CATALYST. U.S. 2,541,801 (1951) February 13.

Removal of adsorbed and entrained gaseous hydrocarbons from solid catalyst is accomplished by an elongated vertical chamber divided into several zones by partitions alternately inclined in opposite directions, the partitions being perforated at their respective upper portions to allow for the distribution of stripping gas through the down flowing solids.

C. Von Fredersdorff

Catalytic Reforming

ATLANTIC REFINING ANNOUNCES NEW CATALYTIC REFORMING PROCESS. *Petroleum Refiner* 30, 86-87 (1951) *March.*

The Atlantic Refining Co. has developed a hydroforming process for upgrading naphtha. The process is a continuous, non-regenerative process in which the charge and recycled hydrogen are passed over pelleted catalyst at temperatures of 850-1000°F and pressures of 300-700 psig. Aromatics are produced by reactions involving isomerization and dehydrogenation.

C. H. Riesz

Fluid Cracking

Anderson, N. K. (assigned to Universal Oil Products Co.) CATALYTIC CONVERSION OF HYDROCARBONS. U.S. 2,541,186 (1951) February 13.

A new arrangement of fluid catalytic cracking apparatus is proposed in which the dense phase reaction and regeneration zones are enclosed in a single vertical vessel.

C. Von Fredersdorff

Petroleum Production

CENTRIFUGAL COMPRESSORS IN PETROLEUM ENGINEERING. *Petroleum Engr.* 23C, 32-36 (1951) *March.*

This is the first of a set of articles on applications of centrifugal compressors to the petroleum and natural gas industry. Stress is placed on the advantages of the centrifugal compressor but it is pointed out that there are many applications to which the reciprocating type is very well suited.

J. D. Parent

Shale Oil Production

Hull, W. Q., Guthrie, B. and Sipprelle, E. M. LIQUID FUELS FROM OIL SHALE. *Ind. Eng. Chem.* 43, 2-15 (1951) *January.*

Mining, retorting and refining in the production of oil from oil shale are reviewed. The work accomplished at the Bureau of Mines demonstration plant at Rifle, Colorado, is described.

C. H. Riesz

Thorne, H. M., Murphy, W. I. R., Ball, J. S., Stanfield, K. E. and Horne, J. W. CHARACTERISTICS AND UTILIZATION OF OIL SHALE AND SHALE OIL. *Ind. Eng. Chem.* 43, 20-27 (1951) *January.*

The nature of oil shales, shale oils and their products are reviewed in relation to products obtained by the Bureau of Mines in its research.

C. H. Riesz

Sohns, H. W., Mitchell, L. E., Cox, R. J., Barnet, W. I. and Murphy, W. I. R. HEAT REQUIREMENTS FOR RETORTING OIL SHALE. *Ind. Eng. Chem.* 43, 33-36 (1951) *January.*

The heat requirements for retorting a 28 gallon-per-ton oil shale and the heat content of spent shale were determined up to 1100°F.

C. H. Riesz

Sulfur Removal

Hughes, E. C., Scovill, W. E., Whitacre, C. H., Faris, R. B., Bartleson, J. D. and Darling, S. M. SEPARATION OF SULFUR AND AROMATICS FROM PETROLEUM. *Ind. Eng. Chem.* 43, 750-753 (1951) *March.*

The high-sulfur crudes produced in this country have less value than the sweet crude oils. The sulfur compounds are troublesome to refine, requiring special noncorrosible equipment. The presence of the sulfur in products is undesirable in every case. The work was undertaken in an effort to provide basic information on a novel method of separating sulfur compounds. It was shown that the majority of sulfur compounds in crude oil and even in the heaviest 50% of the crude oil can be removed by the new combination of reagents and that it is also possible to separate the aromatics. The

significance of these results is twofold. The fundamental science shows that the system hydrogen fluoride-boron trifluoride will form complexes with aromatics and sulfur compounds in the same way as Friedel-Crafts catalysts and that it is possible to disassociate these complexes at higher temperatures with recovery of the reagents. Practically it would be possible to use these reagents for large scale separations of sulfur or aromatic compounds. The process is in competition with solvent extraction processes. The reagent is highly selective and easily recoverable. Preparations of high quality kerosenes, lubricating oils, and crude oils from stocks of poor quality are suggested as possible uses for the reagent.

Authors' abstract

Kalichevsky, V. A. SWEETENING AND DESULFURIZATION OF LIGHT PETROLEUM PRODUCTS. PART V. SWEETENING WITH COPPER CHLORIDE. *Petroleum Refiner* **30**, 122-125 (1951) *March.*

Commercial copper sweetening processes are reviewed and classified under slurry, solid or solution contact methods. Copper sweetening generally involves use of copper chloride. In the process, copper mercaptides are formed with simultaneous liberation of hydrochloric acid, the mercaptides reacting with acid and oxygen to form disulfides and water and while regenerating copper chloride. Oils charged to the sweetening units must be free of hydrogen sulfide and elemental sulfur. The water content of the feed stream must also be controlled to prevent water buildup. Slight quantities of dissolved copper must be deactivated or removed from the product. The bibliography includes 79 references, mainly patents.

C. H. Riesz

Synthetic Fuels

Foster, A. L. SYNTHETIC FUELS PLANT IN SHAKEDOWN STAGE. *Petroleum Engr.* **23C**, 29-30 (1951) *February.*

The synthetic fuels plant of Carthage Hydrocol at Brownsville, Texas, and the adjacent by-products recovery plant of Stanolind Oil and Gas Company are understood to be in the "shakedown" stage of initial operation.

C. H. Riesz

Frankenburg, W. G. (assigned to Hydrocarbon Research, Inc.) CATALYTIC REDUCTION OF CARBON OXIDE BY HYDROGEN. U.S. 2,539,414 (1951) January 30.

Tungsten carbide is claimed as a catalyst for the synthesis of liquid hydrocarbons from carbon monoxide and hydrogen.

C. H. Riesz

Buchmann, F. J. and Sumerford, S. D. (assigned to Standard Oil Development Co.) HYDROCARBON SYNTHESIS. U.S. 2,541,677 (1951) February 13.

In the fluidized synthesis of hydrocarbons from carbon monoxide and hydrogen, the disintegration of iron catalyst is suppressed by pretreatment with a synthesis gas containing a high partial pressure of hydrogen.

C. H. Riesz

Hemminger, C. E. (assigned to Standard Oil Development Co.) HYDRO-CARBON SYNTHESIS. U.S. 2,542,517 (1951) February 20.

Yields of hydrocarbons synthesized from carbon monoxide and hydrogen are increased by recycling at least a part of the oxygenated products.

C. H. Riesz

Jewell, J. W. and Johnson, W. B. (assigned to M. W. Kellogg Co.) METHOD FOR SYNTHESIS OF ORGANIC COMPOUNDS. U.S. 2,543,974 (1951) March 6.

Hydrogenation of carbon monoxide is conducted in a fluidized catalyst bed reactor at temperatures of 300° to 700°F, pressures up to 500 psig and with a linear gas velocity above 6 feet per second.

C. H. Riesz

Keith, P. C. (assigned to Hydrocarbon Research, Inc.) SYNTHESIS OF HYDROCARBONS. U.S. 2,539,434 (1951) January 30.

Gas oil is injected into a stream of hydrogen-carbon monoxide gases issuing from a synthesis gas generator at above 1800°F, thereby effecting a pyrolytic conversion of the oil. The remaining mixture is subjected to synthesis after removing materials non-vaporizable at synthesis conditions.

C. H. Riesz

Kodama, S., Funabashi, W., Hashimoto, G., Hirao, T., Tahara, H., Matsumura, A., Kato, J. and Tarama, Y. PROCESS DEVELOPMENT IN THE HYDROCARBON SYNTHESIS TO 1941. *U. S. Bureau of Mines Information Circular* 7593 (1951) February.

This report summarizes the experimental process development of Fischer-Tropsch synthesis carried out in Japan during the period 1937-1941. The construction and operation of various types of catalytic converters containing 0.1, 3, 6, 10 and 100 cubic meters of catalyst is described. The early work was based entirely on cobalt catalysts but tests with iron catalyst in the largest converter were made in 1940 when it became evident that cobalt was not available in sufficient quantities for projected industrial use. The maximum yearly production of Fischer-Tropsch liquids was 149,250 barrels, in 1944.

C. H. Riesz

Kummer, J. T., Podgurski, H. H., Spencer, W. B. and Emmett, P. H. MECHANISM STUDIES OF THE FISCHER-TROPSCH SYNTHESIS. THE ADDITION OF RADIOACTIVE ALCOHOL. *J. Am. Chem. Soc.* 73, 564-569 (1951) *February.*

Small amounts of ethyl alcohol containing radioactive carbon were added to a 1:1 mixture of carbon monoxide and hydrogen. This gas mixture passed over an iron catalyst gave products which varied in radioactivity. The methane formed had negligibly small activity. The higher hydrocarbon gave results which suggest that the ethyl alcohol, or the adsorption complex it forms, behaves like an intermediate in hydrocarbon synthesis. Analysis of the C3-fraction indicates that the carbon is added to the alpha-carbon atom of the complex.

C. H. Riesz

Litton, J. B. and Schiller, J. C. (assigned to Standard Oil Development Co.) PROCESS FOR PRODUCING HYDROCARBONS. U. S. 2,540,587 (1951) February 6.

Alcohols contained in the reaction mixture from the synthesis of hydrocarbons from carbon monoxide and hydrogen are dehydrated by contact with dehydration catalyst under suitable conditions.

C. H. Riesz

Lynch, C. S., Wasserbach, T. B. and Guyer, W. R. F. (assigned to Standard Oil Development Co.) METHOD OF MAKING COMMERCIAL MIXTURES OF HYDROGEN AND CARBON MONOXIDE. U. S. 2,541,657 (1951) February 13.

Production of carbon monoxide for addition to synthesis gas mixtures (CO and H_2) is accomplished at elevated temperatures by reacting metal oxides (e.g., iron or copper) with gaseous hydrocarbons to form carbon dioxide and steam, removing the steam by condensation, and reacting carbon dioxide with the reduced metal to form carbon monoxide.

C. H. Riesz

McGrath, H. G. (assigned to M. W. Kellogg Co.) SYNTHESIS OF ORGANIC COMPOUNDS. U. S. 2,539,847 (1951) January 30.

Conditions conducive to the formation of oxygenated compounds from carbon monoxide and hydrogen are specified for a cobalt-thoria-bentonite catalyst.

C. H. Riesz

McGrath, H. G. (assigned to M. W. Kellogg Co.) SYNTHESIS OF ORGANIC COMPOUNDS. U. S. 2,542,422 (1951) February 20.

A procedure is described for activating iron catalyst used in the synthesis of hydrocarbons from carbon monoxide and hydrogen. Temperatures, pressures, and amounts and nature of synthesis gas are specified.

C. H. Riesz

Wolfson, M. L., Pelipetz, M. G., Damick, A. D. and Clark, E. L. VAPOR-PHASE HYDROGENATION OF LIGHT AND HEAVY OILS. *Ind. Eng. Chem.* 43, 536-540 (1951) *February.*

An experimental unit for the hydrogenation of oils over a fixed catalyst bed at 932°F and 10,000 psi is described. An aromatic light oil from coal hydrogenation hydrogenated at 932°F, 9,000 psi and a space velocity of 1 liquid volume per volume catalyst-hour gave 47% gasoline.

C. H. Riesz

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Harmon, D. D. and Russell, R. G. IMPURITIES IN CATALYST MATERIALS. p. 63

Hindin, S. G. Mills, G. A. and Oblad, A. G. HYDROGEN EXCHANGE BETWEEN CRACKING CATALYST AND THE BUTANES. p. 64

7. ANALYTICAL METHODS AND TESTS

Density of Particles

Ergun, S. DETERMINATION OF PARTICLE DENSITY OF CRUSHED POROUS SOLIDS. *Anal. Chem.* 23, 151-156 (1951) *January.*

The gas flow equation (*Gas Abstracts* 5, 197) previously used for the correlation of pressure drop through fixed beds has been extended to permit estimation of particle (apparent) density. Coefficients for the linear pressure drop equation were determined by measurement of pressure drops and flow rates at different bulk densities. Plotting of bulk densities and coefficients according to linear equations permitted extrapolation to the intercept, giving two values for the particle density. The method showed good agreement with the water displacement method for non-porous solids. The particle densities of sized coke fractions increased as the size decreased, because of the absence of larger pores in the smaller particles. The increase was quite rapid at an average screen opening of 3 mm.

W. E. Ball

Electron Microscopy

Hamm, F. A. ELECTRON MICROSCOPY. *Anal. Chem.* 23, 17-20 (1951) *January.*

A review of the progress of electron microscopy in 1950 is presented. New instruments and improvements in existing microscopes are noted and large strides in metallurgical and biological techniques are reported. Sixty-one literature references accompany the article.

D. V. Kniebes

Mass Spectrometry

Rock, S.M. QUALITATIVE ANALYSIS FROM MASS SPECTRA. *Anal. Chem.* 23, 261-268 (1951) *February.*

This paper presents methods of using mass spectra for qualitative analysis. A table of the mass spectra of 279 compounds is given. Peaks are roughly classified by magnitude, and the compounds are separated into similar groups. This method is also valuable for reliably proving the absence of compounds as well as their presence.

D. V. Kniebes

Spectrometric Analysis

Harmon, D. D. and Russell, R. G. IMPURITIES IN CATALYST MATERIALS. *Anal. Chem.* 23, 125-128 (1951) *January.*

A detailed method of spectroscopic analysis of silica-alumina base catalysts for Fe, V, Na, Ni impurities is given. Briquetted samples and spark excitation are used, giving high reproducibility. The time of analysis for a set of samples is not more than 4 hours, and the accuracy is $\pm$ 10% of the amount present.

I. Ladany

Liebhafsky, H. A. X-RAY ABSORPTION *Anal. Chem.* 23, 14-16 (1951) *January.*

Reference is made to two as yet unpublished papers on the determination of sulfur in distillate fuels and petroleum fractions. The Glocker-Frohnmayer method of x-ray absorption spectrometry is described. In a test of the method on aqueous samples of 1 cu. mm. containing known microscopic amounts of iron, an accuracy of 5% is claimed.

I. Ladany

Adsorption

Jones, D. C. SOME COMMENTS ON THE B. E. T. (BRUNAUER-EMMETT-TELLER) ADSORPTION EQUATION. *J. Chem. Soc. (London)* 1950 126-130 (*January*).

A comparison is made between the "classical" B. E. T. adsorption equation which assumes monomolecular adsorption, and Langmuir's Case IV (multiple adsorption at each point) and Case VI (multilayer adsorption). The equation is analyzed to describe the various forms of adsorption isotherms.

S. Katz

Jura, G. and Powell, R. E. KINETICS OF GAS ADSORPTION AS A METHOD OF AREA DETERMINATION. *J. Chem. Phys.* **19**, 251-252 (1951) *February.*

By assuming that (1) the rate-determining step in gas adsorption involves a single molecule so that the rate is proportional to the first power of pressure, and (2) the adsorbed molecules are in equilibrium over the entire surface, a measurement of adsorption kinetics will lead to a determination of the surface area of a solid. This determination is independent of that obtained by the theoretical treatment of the equilibrium measurements by the BET and the HJ methods. Derivation of the development of the method is shown.

O. P. Brysch

Cracking Mechanism

Hindin, S. G., Mills, G. A. and Oblad, A. G. HYDROGEN EXCHANGE BETWEEN CRACKING CATALYST AND THE BUTANES. *J. Am. Chem. Soc.* **73**, 278-281 (1951) *January.*

The hydrogen exchange reactions of normal butanes and isobutane in the presence of silica-alumina cracking catalysts have been studied. The exchange at 302°F between catalyst and isobutane was much more rapid than the exchange with normal butane. The tertiary hydrogen exchange is negligible whereas primary hydrogen exchange is rapid in isobutane. The water content was indicated to be present in more than one structural arrangement. The addition of air or of olefin accelerated the exchange only to a minor extent. The results are discussed in relation to the acid nature of the catalyst.

C. H. Riesz

Flame Research

Gaydon, A. G. FLAMES: THEIR STRUCTURE AND RADIATION. *Endeavour* (*British*) **10**, 17-21 (1951) *January.*

The study of the radiation emitted by ions in flame reactions has led to advances in knowledge of the chemical processes involved, and of the way in which energy is transferred between molecules. This article discusses some of the methods and results of radiation studies on low pressure bunsen-type flames and diffusion-type flames with respect to the possible mechanisms promoting carbon formation and luminosity in flame reactions.

D. L. Nicol

Flame

Gerstein, M., Levine, O. and Wong, E. L. FLAME PROPAGATION. II. THE DETERMINATION OF FUNDAMENTAL BURNING VELOCITIES OF HYDROCARBONS BY A REVISED TUBE METHOD. *J. Am. Chem. Soc.* **73**, 418-422 (1951) *January.*

A method is described for the determination of fundamental rates of flame propagation in tubes. This method incorporates modifications to reduce pressure waves which disturb the flame and render the motion non-uniform. Data are presented for a variety of hydrocarbons including normal and branched alkanes, alkenes, and alkynes as well as cyclohexane and benzene.

D. L. Nicol

Simon, D. M. FLAME PROPAGATION. III. THEORETICAL CONSIDERATION OF THE BURNING VELOCITIES OF HYDROCARBONS. *J. Am. Chem. Soc.* **73**, 422-425 (1951) *January.*

A comparison study is made relating the burning velocities of 35 hydrocarbons with the active particle diffusion theory of flame propagation. Excellent agreement for all gases except ethylene is stated.

D. L. Nicol

8. GENERAL AND PHYSICAL CHEMISTRY

Hydrate Structure

Claussen, W. F. SUGGESTED STRUCTURES OF WATER IN INERT GAS HYDRATES. *J. Chem. Phys.* **19**, 259-260 (1951) *February.*

An effort has been made with models to work out a structure for gas hydrates. A model is proposed, but it is not in agreement with the cubic structure suggested by Stackelberg on the basis of x-ray analyses. J. D. Parent

Interfacial Tensions

Hough, E. W., Rzasa, M. J. and Wood, B. B. INTERFACIAL TENSIONS AT RESERVOIR PRESSURES AND TEMPERATURES; APPARATUS AND THE WATER-METHANE SYSTEM. *J. Petroleum Technol.* (*sec.* **1**) **3**, (1951) 57-60 *February.*

The interfacial tension of the water-methane system has been measured at pressures up to 15,000 psi and at temperatures ranging from 74°F to 280°F. A stray pressure dependence has been found. J. D. Parent

Kinetics

Broida, H. P. and Oldenberg, O. THE THERMAL HYDROGEN-OXYGEN REACTION AT RELATIVELY LOW TEMPERATURES. *J. Chem. Phys.* **19**, 196-202 (1951) *February.*

The explosion of hydrogen-oxygen mixtures was studied in a constant volume bomb coated with KC1. The authors use a criterion stated by Lewis and Von Elbe to show that the same volume chain which explains the reaction at higher temperatures applies to the temperature range 500°-350°C. The inhibition period within the low-pressure explosion region and the branching of the chains are briefly discussed.

D. L. Nicol

Hoog, H. CATALYTIC HYDRO-DESULFURIZATION OF GAS OIL: ANALYSIS OF THE KINETICS OF REACTION. *J. Inst. Petroleum* (*British*) **36**, 738-751 (1950) *December.*

Middle East gas oil was desulfurized by hydrogenation in the presence of a cobalt-molybdena catalyst at 707°F and at elevated pressures (11, 26 and 51 atm.). The sulfur is eliminated as hydrogen sulfide at various rates down to a level corresponding to about 5% of the original sulfur content which was found to remain even at long residence time. A first-order rate equation described the kinetics of desulfurization of two narrow fractions, the light fraction being desulfurized at a much higher velocity than the heavy cut. The overall rate curves for the wide-range gas oil therefore vary with the boiling points and prevent determination of an overall rate constant. The initial reaction velocity is influenced by both the hydrogen partial pressure and the oil partial pressure. The results indicate a mechanism whereby the reaction proceeds by interaction of sulfur-containing molecules and hydrogen atoms formed by activated adsorption of hydrogen molecules.

C. H. Riesz

Norris, T. H. and Ruben, S. KINETICS OF THE ISOTOPIC EXCHANGE REACTION BETWEEN CARBON MONOXIDE AND CARBON DIOXIDE. *J. Chem. Phys.* **18**, 1595-1600 (1950) *December.*

The exchange reaction between carbon monoxide and carbon dioxide was studied, using a C^{14} tracer. A rate law of the form

$$r = \underline{k}\ (\underline{p}\ CO)^{0.73}\ (\underline{p}\ CO_2)^{0.85}$$

applies at 850°C (1562°F). It is believed that the reaction occurs as a bimolecular exchange between the two gases adsorbed on a catalytic surface.

S. Katz

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Arthur, J. R. and Bowring, J. R. PHYSICO-CHEMICAL ASPECTS OF THE COMBUSTION OF SOLID FUELS. p. 51

Hamm, F. A. ELECTRON MICROSCOPY. p. 63

Liebhafsky, H. A. X-RAY ABSORPTION. p. 63

Robinson, C. F., Washburn, H. W., Berry, C. E. and Perkins, G. D. A MASS SPECTROMETER FOR MONITORING CONTINUOUS PROCESSES. p. 67

Rock, S.M. QUALITATIVE ANALYSIS FROM MASS SPECTRA. p. 63

10. CHEMICAL ENGINEERING

Cooling Towers

Dresser, H. A. COOLING TOWERS: THEIR OPERATION AND MAINTENANCE. *Gas* **27**, 83, 84, 86, 87 (1951) *March.*

Operational difficulties and recommended inspection schedules are presented.

J. D. Parent

Shields, H. and Sorg, L. V. HOW STANDARD OF INDIANA ACHIEVES STABILIZATION OF COOLING-TOWER WATER AT ITS SUGAR CREEK REFINERY. *Oil Gas J.* **49**, 52, 55, 59, 60, 62 (1951) *March* 1.

A process used by Standard of Indiana for reducing water turbidity and inhibiting corrosion and scale deposition is reported. Several types of treatment were tried on pilot scale before final process selection.

J. D. Parent

Fractionation

Chu, J. C., Donovan, J. R., Boswell, B. C. and Fuhrmeister, L. C. HOW TO ESTIMATE PLATE EFFICIENCY. PART 2. APPROXIMATE METHOD FOR ESTIMATION OF OVERALL PLATE EFFICIENCY. *Petroleum Processing* **6**, 154-157 (1951) *February.*

An approximate method of estimating the overall plate efficiency of a fractionator is presented.

J. D. Parent

Fulton, W. F. (assigned to Warren Petroleum Corp.) METHOD OF SEPARATING SELECTED CONSTITUENTS FROM GASES. U. S. 2,542,187 (1951) February 20.

It is claimed that absorption and fractional distillation are rendered more effective if a suitable substance is added which confers nonideal solution characteristics. Fatty acid esters are among the agents found useful for hydrocarbon systems.

J. D. Parent

Hutchinson, A. J. L. A SYSTEM OF PROCESS CALCULATIONS FOR LIGHT HYDROCARBONS. *Petroleum Refiner* **30**, 69, 107-112 (1951) *February.*

This is an elementary explanation of a procedure for tray to tray calculations for light hydrocarbon fractionators.

J. D. Parent

Heat Transfer

Brownscombe, E. R. and Kern, L. R. GRAPHICAL SOLUTION OF SINGLE PHASE FLOW PROBLEMS. *Petroleum Engr.* **23B**, 7-10, 12 (1951) *February.*

Schmidt's graphical method of solving heat flow problems is applied to transient flow of single phase fluids through linear and radial reservoirs.

J. D. Parent

Deissler, R. G. INVESTIGATION OF TURBULENT FLOW AND HEAT TRANSFER IN SMOOTH TUBES, INCLUDING THE EFFECTS OF VARIABLE FLUID PROPERTIES. *Trans. Am. Soc. Mech. Engrs.* **73**, 101-107 (1951) *February.*

The authors have devised an equation for velocity distribution in smooth tubes. The results are presented in terms of one equation for the viscous and buffer layer and another equation in the turbulent layer. The article presents heat transfer coefficients for tubes. The dimensionless groups are evaluated at mean film properties. By proper choice of the mean film temperature, the same equation works quite well for both heating and cooling of a gas.

R. E. Peck

Morales, M., Spinn, C. W. and Smith, J. M. VELOCITIES AND EFFECTIVE THERMAL CONDUCTIVITIES IN PACKED BEDS. *Ind. Eng. Chem.* **43**, 225-232 (1951) *January.*

Velocity distribution in packed beds was determined. The results show considerable variation over the radius. The maximum value of the velocity came between the center and the wall of the tube. The article shows the similarity of velocity profiles to the thermal conductivity group (Ke/C_pG) profiles.

R. E. Peck

Hydrogen Manufacture

Coffey, J. F. (assigned to Standard Oil Co.) HYDROGEN MANUFACTURE. U. S. 2,538-235 (1951) January 16.

A procedure is described for the manufacture of hydrogen by the reaction of steam with coal or coke in the presence of calcium carbonate in a fluidized bed. Heating is provided by combustion with air or oxygen into the reaction zone.

S. Katz

Solid Gas Contacting

Palmer, J. S. DEVICE FOR CONTROLLING FLOW OF SOLIDS IN A POWDERED SOLID AND GAS CONTACTING OPERATION. U. S. 2,541,662 (1951) February 13.

Circulation of fluidized reactivated solids from regenerator to reactor is accomplished by a steam stream to aid gravity flow, while controlled flow of spent solids from reactor to regenenerator is obtained by means of a standpipe discharging into a pipe section consisting of two concentric air lines through which is passed a controlled quantity of air.

C. Von Fredersdorff

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Continuous Analyzers

Thomas, B. W. FUTURE HOLDS GREAT PROMISE FOR CONTINUOUS ANALYZERS. *Petroleum Refiner* **30**, 81-84, (1951) *February.*

The operating principles of continuous infrared analyzers, densitometers, dielectric constant meters, and refractometers, and their applications to industrial processes are presented. The future for continuous analyzers of all types is considered to be very promising.

D. V. Kniebes

Micromanometer

Wood, H. R. A NEW MICROMANOMETER. *Natl. Gas Bull.* (*Australia*) **14**, 3-6 (1951) *November-December.*

The article describes the design, construction and operation of a micromanometer which can be used to measure low static pressures with an accuracy of 0.001 in. water gauge. A rigid U-tube is the basic of the design. The displacement of the liquid from the zero position on the application of the pressure is measured by means of a micrometer screw which is screwed down the arm of the U-tube until contact is made with the meniscus by the pointed end of the screw. To aid visual observation of this contact an ingenious optical system is incorporated in the instrument.

K. Nagaraja Rao

Spectrometric Monitor

Robinson, C. F., Washburn, H. W., Berry, C. E. and Perkins, G. D. A MASS SPECTROMETER FOR MONITORING CONTINUOUS PROCESSES. *Instruments* **24**, 25-29 (1951) *February.*

A mass spectrometer developed specifically for industrial process monitoring is described. A limited number of preselected mass peaks are recorded, and the instrument standardizes itself periodically against a gas of known composition. Record presentation is such that an untrained operator can easily recognize any instrument malfunction should it occur. Rapid and accurate responses to changes in gas stream composition and moderate maintenance requirements are claimed.

D. V. Kniebes

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Ames, C. B. NATURAL GAS DEHYDRATION IS ROBOTIZED IN 15 SOLID DESSICANT TYPE PLANTS. p. 56

12. MATERIALS OF CONSTRUCTION

Corrosion

Kellogg, L. A. CORROSION CONTROL PROGRAM. *Gas Age* 107, 11-13 (1951) *March* 1.

The corrosion control program as applied to a recently laid transmission line is described. Coating procedures, inspections, and results are discussed.

B. E. Hunt

CORROSION AND ITS CONTROL: ATTENUATION CURVES IN CATHODIC PROTECTION. *Oil Gas J.* 49, 85 (1951) *March* 15.

The limitation of attenuation curves are described as being the assumptions of (1) long uniform structure with uniform current leakage and (2) current drained from the line discharging to remote earth and not to an adjacent ground bed.

B. E. Hunt

Osborn, O. COMBATING CORROSION IN A CHEMICAL PLANT WITH MAGNESIUM ANODES. *Corrosion* 7, 2-9 (1951) *January.*

Magnesium anodes have proven useful in combating corrosion in various types of chemical plant equipment. The installation of magnesium anodes in various pieces of equipment such as sea water flumes, open condensers and heat exchanger water boxes, and tanks and process vessels is discussed. Data are presented which show that maintenance expenditures were reduced from 1/4 to 1/16 of their original value after the installation of magnesium anodes.

B. E. Hunt

Parker, M. E. CORROSION AND ITS CONTROL. PIPE-TO-SOIL POTENTIALS AS AN INDICATION OF PROTECTION. PART 5. *Oil Gas J.* 49, 95, 107 (1951) *March* 8.

Pipe to soil potentials are an important indication as to the effectiveness of a cathodic protection program. No information is given as to the proper method of making these measurements.

B. E. Hunt

Smith, S. S., Curry, W. J. and Rush, E. H. INTERNAL AND EXTERNAL CORROSION EXPERIENCE IN SHELL'S PRODUCTS PIPE LINES. *Corrosion* 7, 20-28 (1951) *January.*

This paper is divided into two section. The first discusses the results of using alkaline nitrite as an internal corrosion inhibitor in product pipe lines. A generalized statement is made of the increase of capacity that can be expected. The second section discusses the use of magnesium anodes as an external corrosion preventive. Both pilot plant and field studies are reported. The conclusions drawn are that proper field testing and installation of magnesium anodes can double the expected life of uncoated pipe lines.

B. E. Hunt

Palmer, W. G. CORROSION INHIBITORS FOR STEEL. *Corrosion* 7, 10-19 (1951) *January.*

The theory is advanced that anodic inhibitors when used in insufficient quantities are not effective due to the formation of membranous films over the point of attack. It was suggested that by the addition of a suitable oxidizing agent in the correct proportions with the anodic inhibitor a crystalline plug would be formed and thus stop the corrosion. Several tests using potassium phosphate as the inhibitor, and either potassium dichromate, potassium chromate, and potassium persulfate as the oxidizing agent were performed to substantiate this theory.

B. E. Hunt

LaQue, F. L. PRACTICAL AND RELATIVE SIMPLE CORROSION TESTS FOUND EFFECTIVE. *Petroleum Refiner* 30, 120-122 (1951) *February.*

Testing procedures and equipment are described whereby several specimens may be tested under actual plant conditions.

B. E. Hunt

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Parker, M. E. INSPECTION OF PIPE COATINGS. p. 57

Pogacar, C. F. and Tice, E. A. CORROSION PROBLEMS IN THE MODERN BY-PRODUCT COKE PLANT. p. 52

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